

PATENT APPLICATION
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Docket No: Q80646

Hideaki NARUSE, et al.

Appln. No.: 10/806,421

Group Art Unit: 1794

Confirmation No.: 2271

Examiner: Camie S. Thompson

Filed: March 23, 2004

For: GAS BARRIER LAMINATE FILM AND PRODUCTION METHOD THEREFOR AS
WELL AS SUBSTRATE AND IMAGE DISPLAY DEVICE UTILIZING THE FILM

DECLARATION UNDER 37 C.F.R. § 1.132

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Hiroshi IWANAGA, hereby declare and state as follows:

I am a citizen of Japan.

I received a Masters Degree in Polymer Engineering from the Tokyo Institute of
Technology, Graduate School of Engineering in 1990.

I am employed by FUJIFILM Corporation, where I am engaged in the research and
development of gas barrier films at Fuji's Ashigara Research Laboratories and Kaisei Research
Laboratories.

I am a co-inventor of the subject matter of the present application, U.S. Application Serial
No. 10/806,421. I am familiar with the prosecution of the application, including the Office
Action mailed January 28, 2008, containing a §102(e) anticipation rejection of claims 1-2, 4 and
7-13 based on U.S. Patent No. 6,638,645 ("Sawai"); a §103 obviousness rejection of claims 3

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and 14-20 based on Sawai in view of U.S. Patent No. 5,766,751 ("Kotani"); and a §103 obviousness rejection of claims 14-20 based on Kotani.

I submit this Declaration in support of the patentability of the present claims.

Specifically, I have conducted the following experiments to show that Sawai's Example 1, which is the embodiment of Sawai that is closest to the present claims, does not satisfy the difference in oxygen transmission recited in present claim 1. In other words, the following experiments demonstrate that Sawai fails to disclose a gas barrier film in which the difference between the oxygen transmission rate at 25 °C in a relative humidity of 10% and the oxygen transmission rate at 25 °C in a relative humidity of 90% is within the range of 1.0×10^{-5} ml/m²•day•Pa.

(Replication of the Sawai's Example)

As mentioned above, I replicated Example 1 of Sawai. In this regard, I made up for the conditions which are not described by Sawai with conditions that a person skilled in the art would think appropriate (each instance is pointed out below).

In a mixture solvent of 30 parts of ethanol and 58 parts of isopropyl alcohol, 3 parts of Component (A), $\text{CF}_3-(\text{CH}_2)_n-\text{Si}(\text{OCH}_3)_3$ ($n=2$) (manufactured by Shin Etsu Co., Ltd., KBM7103), Component (B), an alkoxy group-containing photosensitive acrylic resin, and Component (C), $\text{CH}_2=\text{CHSi}(\text{OCH}_3)_3$ (manufactured by Shin Etsu Co., Ltd., KBM1003) were mixed at a molar ratio of (A) : (B) : (C) = 1 : 1 : 1. Herein, the composition of Component (B) is not concretely disclosed. I employed an acrylic resin which was synthesized in accordance with the Synthesis Example recited in JP-A-2005-36287. The acrylic resin had a molecular weight of 10,000 and a

nonvolatile component of 46%. The molar quantity of the acrylic resin was defined as the average molecular weight of the acrylic unit.

Six times the molar amount of 0.1N-HCl aqueous solution was added to the above mixture consisting of Component (A), (B) and (C), and then the mixture was agitated at room temperature for 5 minutes. The organic-inorganic hybrid material solution as prepared was coated on a PET substrate having a thickness of 12 μm . Then, an ultraviolet light (365 nm, 10mW/cm²) was applied for 10 minutes under a nitrogen atmosphere. Additional Comparative Example R1 having a thickness of 1 μm on the PET substrate was thus obtained.

For purposes of comparison, a gas barrier layer was formed on a PET substrate having a thickness of 12 μm in the same manner as described in the Example of the present application at page 40, lines 4-21 of the specification. This sample is referred to herein as additional Example N1.

The oxygen transmission rates of the samples R1 and N1 were measured at 30 °C under an atmosphere of relative humidity (RH) of 90 %, and at 20 °C under atmospheres of RHs of 10% and 90 % by using PERMATRAN produced by MOCON, respectively. The measurements were carried out after the samples R1 and N1 remained under the above conditions for 3 days.

The results are shown in Table 1.

Table 1

Film	Thickness (μm)	Oxygen transmission rate ($1.0 \times 10^{-5} \text{ mL/m}^2 \cdot \text{day} \cdot \text{Pa}$)			Note
		30°C90%RH	20°C10%RH	20°C90%RH	
R1	13.2	16.2	5.4	8.3	Replication of Sawai's Example 1
N1	13.2	0.99	0.30	0.61	The present invention

As shown above, in additional Example N1, the difference between the oxygen transmission rate at 20 °C in a RH of 10% and the oxygen transmission rate at 20 °C in a RH of 90% was $0.31 \times 10^{-5} \text{ mL/m}^2 \cdot \text{day} \cdot \text{Pa}$. In contrast, according to additional Comparative Example R1, the difference between oxygen transmission rates at 20 °C in RHs of 10% and 90% was $2.9 \times 10^{-5} \text{ mL/m}^2 \cdot \text{day} \cdot \text{Pa}$, which is substantially higher than that of additional Example N1. In addition, the oxygen transmission rate at 30 °C in RH of 90% of R1 was much higher as compared to that for N1.

Although the difference between the oxygen transmission rates at 25 °C in RHs of 90% and 10% was not measured, a person skilled in the art would readily appreciate from the obtained data that R1 does not satisfy the difference recited in present claim 1. Therefore, it is my opinion that Sawai fails to disclose a gas barrier film having the "difference" recited in present claim 1.

Further, in my opinion, a person skilled in the art would understand that the above experiment properly replicated Sawai's Example as far as can be grasped from the disclosure of Sawai.

Further, the following are my comments on the disclosure of Sawai and the present claims, with particular respect to the structure of the gas barrier layer.

The gas barrier layer recited by present claim 1 is formed by using a polymer having a hydrogen bond-forming group. The formed gas barrier layer contains an intermolecular hydrogen bond therein. The intermolecular hydrogen bond acts as a strong attraction force between molecules and copes flexibly with structural changes depending upon changes in humidity. Thus, the excellent high gas barrier properties were achieved with the present invention.

In Sawai's Example, the organic- inorganic material contains no (or insufficient at least) hydrogen bond inside and main intermolecular attraction would be only weak dipole-dipole interaction caused by acrylate and siloxane groups and van der Waals bond therein. In addition, the bulky groups such as the acrylate groups reduce the density of the organic-inorganic material and make it difficult to form a dense formation of the organic-inorganic material. Therefore, Sawai's Example has a poor oxygen transmission property, and it is my opinion that the organic inorganic layer of Sawai's Example is different in structure from the gas barrier layer defined in claim 1 from the same reason.

In order to demonstrate that the gas barrier layer according to the present claims contains an intermolecular hydrogen bond therein, I measured the NMR thereof as follows.

(Example - NMR measurement)

The gas barrier layer of additional Example N1 as prepared above was freeze-dried so that it could be broken and shattered. As ¹³CP-MAS NMR for N1, the powder of the gas barrier

layer of N1 was measured. Also, ^{13}C -CP-MAS NMR of an ethylene-vinylalcohol copolymer (Nippon Synthetic Chemical Industry Co., Ltd., SOARNOL) was measured since an ethylene-vinylalcohol copolymer is coated under the gas barrier layer in the Example of the present specification. See page 40, lines 5 to 7. The results are shown in Figs. 1 and 2 and Table 2 below.

Fig. 1 shows the result of the gas barrier layer of additional Example N1 and Fig. 2 shows the result of the ethylene-vinylalcohol copolymer. Table 2 shows the intensity ratio thereof.

In Figs. 1 and 2, the peaks (I) and (II) represent intramolecular hydrogen bonds such as a methine and the peak (III) represents an intermolecular hydrogen bond. In the gas barrier layer of additional Example N1, the peak (III) is extremely high. This result demonstrates that the gas barrier layer of additional Example N1 contains intermolecular hydrogen bonds therein.

Although the NMR of additional Comparative Example R1 was not measured, a person skilled in the art would readily appreciate that the inorganic-organic material in R1 does not contain an intermolecular hydrogen bond for *at least* the reasons described above.

Fig. 1

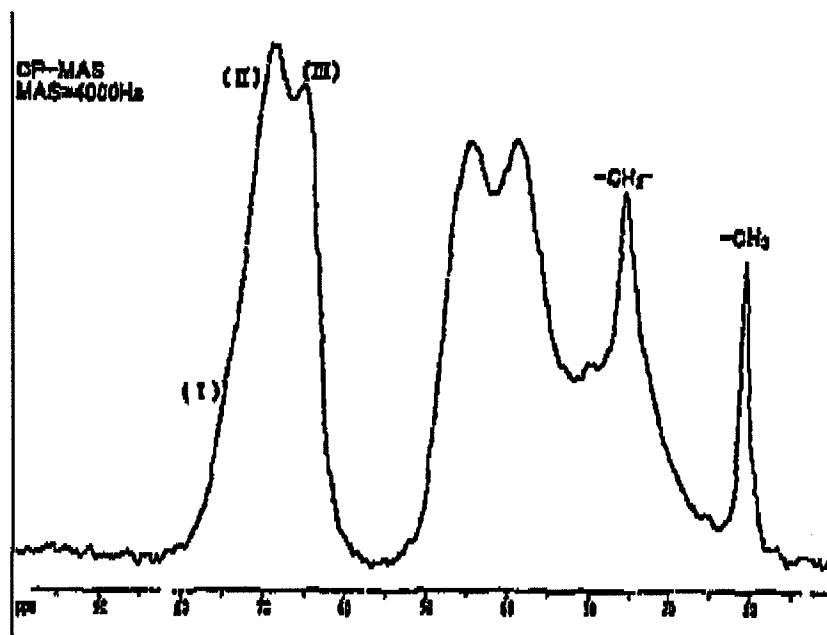


Fig. 2

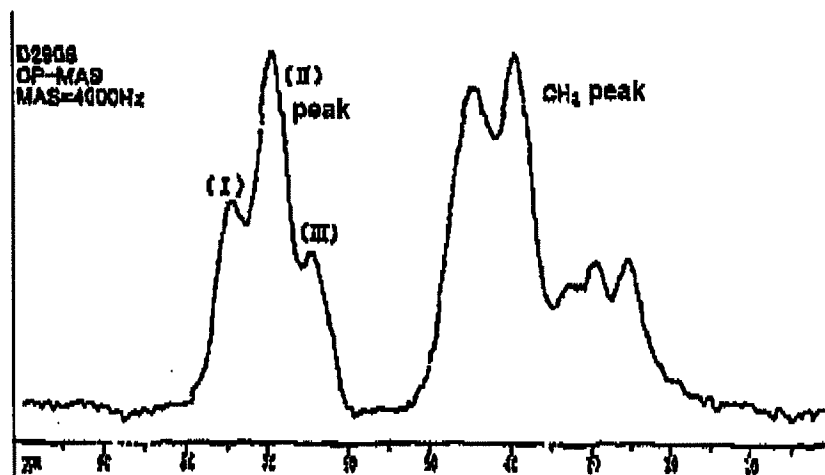


Table 2

	I	II	III
N1	15.2	48.5	36.3
PVA	29.6	50.0	20.4

Further, in Sawai's Example, the siloxane is condensed by the sol-gel method and thereafter a vinyl polymerization reaction using an alkoxy group-containing photosensitive acrylic resin (B) and vinylsiloxane (C) is carried out by applying UV. See Sawai at col. 5, lines 1 to 19.

However, Sawai's Example has *at least* the following two disadvantages in oxygen permeability properties. First, vinyl polymerization causes volume contraction of the polymer and easily forms an oxygen permeating pass into the polymer. Second, Sawai employs Component (A) having a trifluoromethylalkyl group. A layer containing a component having a trifluoromethylalkyl group is low in oxygen permeability property because a trifluoromethylalkyl group has weak interaction (weak hydrophilic bonds) with the other components of the matrix.

Accordingly, it is my opinion that a person skilled in the art would not have employed the teaching of Sawai, which has these disadvantages, to achieve a gas barrier laminate film.

The following are my comments on some of the other claims of the present application.

With regard to the "electromagnetic wave irradiation" defined in present claim 14, it is my opinion that a person skilled in the art would understand that its purpose is different from the

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purpose of the ultraviolet light irradiation in Sawai's Example. In the present application, the electromagnetic wave step is carried out for the purpose of accelerating a condensation reaction of an unreacted OH group in metal alkoxide. In Sawai's Example, the ultraviolet light is irradiated for the purpose of initiating photo polymerization of vinyl groups.

With regard to claims 18 and 19, a person skilled in the art would understand that Kotani carries out the heat aging for a purpose other than drying. Kotani discloses that "it is preferred that the solvent is removed from the system and ~~thereafter~~ a thermal aging treatment is conducted...." See col. 12, lines 61-64 of Kotani.

I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: May 21, 2008

Hiroshi Iwanaga
Hiroshi IWANAGA